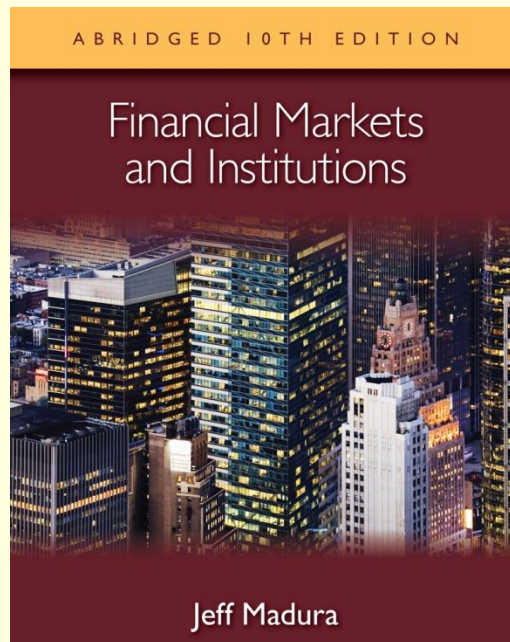


# Financial Markets and Institutions

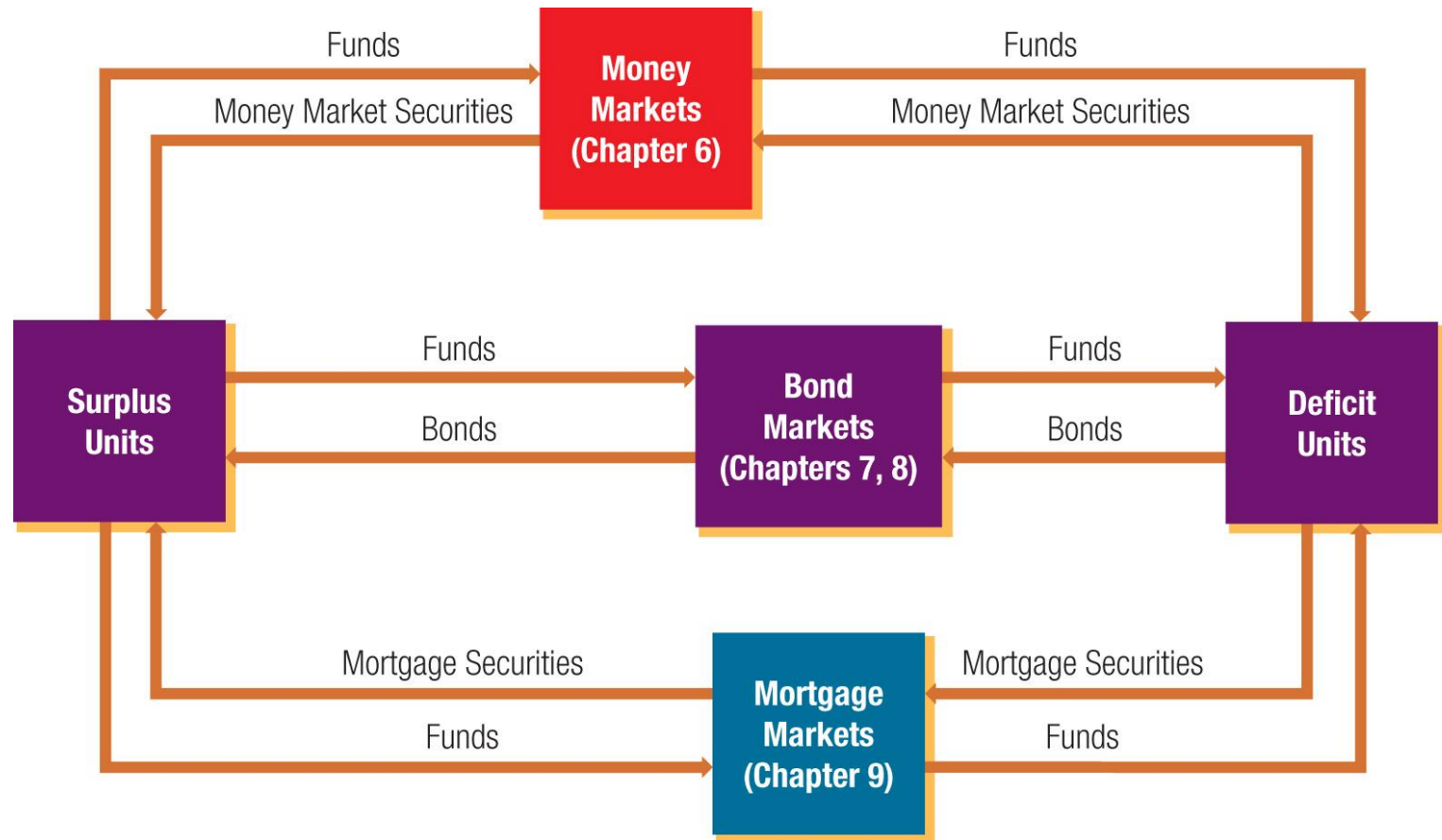
## Abridged 10<sup>th</sup> Edition

**by Jeff Madura**



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# Part 3 Debt Security Markets



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# 6 Money Markets

## Chapter Objectives

- describe the features of the most popular money market securities
- explain how money markets are used by institutional investors
- explain the valuation and risk of money market securities
- explain how money markets have become globally integrated

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# Money Market Securities

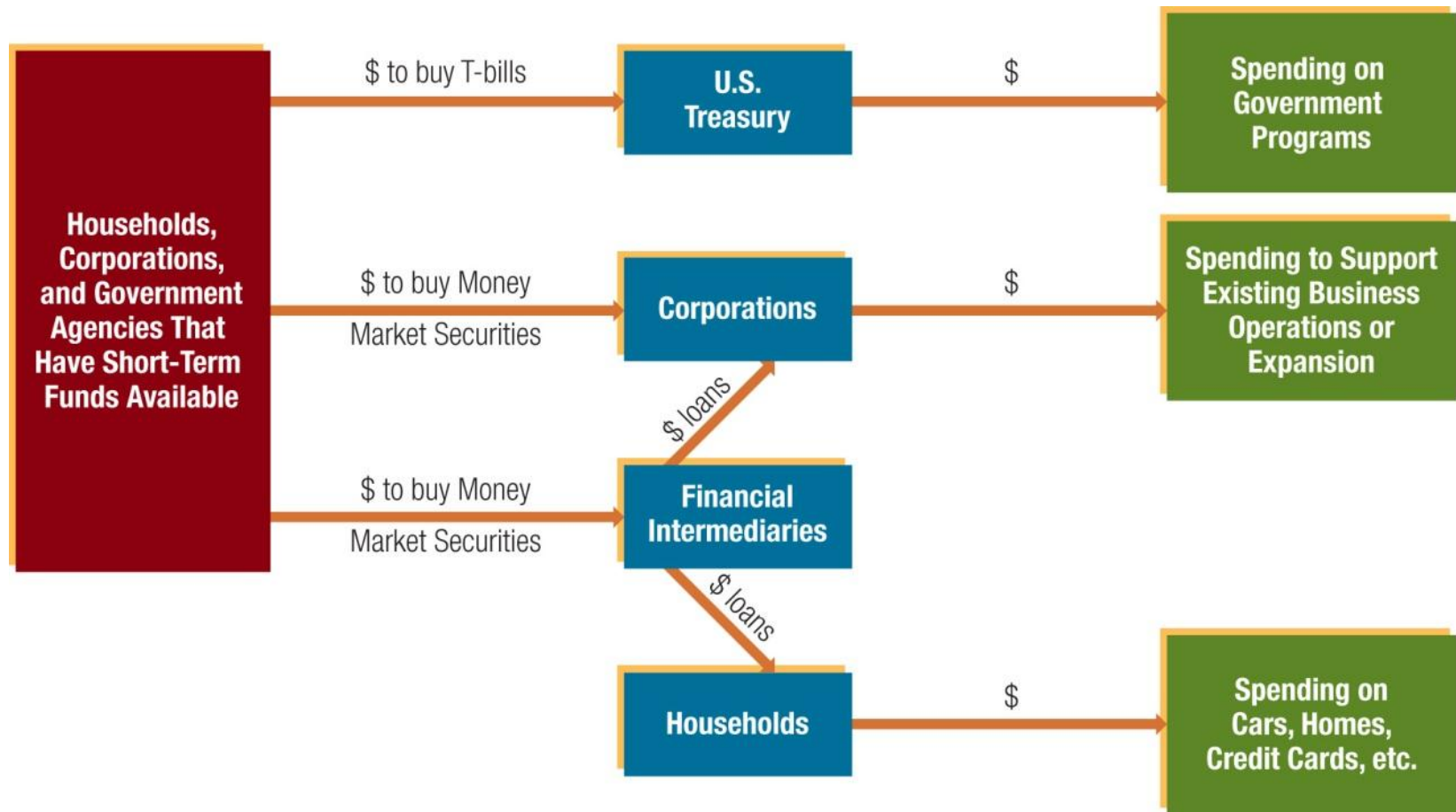
1. Money market securities are debt securities with a maturity of one year or less.
2. Issued in the primary market through a telecommunications network by the Treasury, corporations, and financial intermediaries that wish to obtain short-term financing.
3. Are commonly purchased by households, corporations, and governments that have funds available for a short time period.
4. Can be sold in the secondary market and are liquid.

# Money Market Securities

The more popular money market securities are:

- Treasury bills (T-bills)
- Commercial paper
- Negotiable certificates of deposit
- Repurchase agreements
- Federal funds
- Banker's acceptances

# Exhibit 6.1 How Money Markets Facilitate the Flow of Funds



# Treasury Bills

1. Issued when the U.S. government needs to borrow funds.
2. The Treasury issues T-bills with 4-week, 13-week, and 26-week maturities on a weekly basis.
3. The par value (amount received by investors at maturity) of T-bills was historically a minimum of \$10,000, but now it is \$1,000 and multiples of \$1,000.
4. Are sold at a discount from par value, and the gain is the difference between par value and the price paid
5. Backed by the federal government and are virtually free of credit (default) risk.
6. Highly liquid, due to short maturity and strong secondary market.

# Treasury Bills

## 1. Investors in Treasury Bills

- a. Depository institutions retain a portion of their funds in assets that can be easily liquidated to accommodate withdrawals.
- b. Other financial institutions invest in T-bills in case cash outflows exceed cash inflows.
- c. Individuals with substantial savings invest indirectly through money market funds.
- d. Corporations invest in T-bills to cover unanticipated expenses.

▪



# Treasury Bills

## 2. Pricing Treasury Bills

- a. Priced at a discount from their par value
- b. Price depends on the investor's required rate of return
- c. Value of a T-bill is the present value of the par value

**Example:** If investors require a 7 percent annualized return on a one-year T-bill with a \$10,000 par value, the price that they are willing to pay is:

$$P = \$10,000 / (1.07)$$

$$P = \$9,345.79$$

# Treasury Bills

## 3. Treasury Bill Auction (Exhibit 6.2)

- a. Investors can submit bids online for newly issued T-bills at [www.treasurydirect.gov](http://www.treasurydirect.gov).
- b. Investors have the option of bidding **competitively** or **noncompetitively**.

## Exhibit 6.2 Example of Treasury Bill Auction Results

	13-WEEK TREASURY BILL AUCTION	26-WEEK TREASURY BILL AUCTION
Applications	\$44,685,977,000	\$45,991,246,000
Accepted bids	\$19,022,977,000	\$18,005,496,000
Average price of accepted bids (per \$100 par value)	\$99.20	\$98.40
Coupon equivalent (yield)	0.081%	1.626%

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# Treasury Bills

## 4. Estimating the Yield

$$Y_T = \frac{SP - PP}{PP} \times \frac{365}{n}$$

where

$SP$  = selling price

$PP$  = purchase price

$n$  = number of days of the investment (holding period)

## 5. Estimating the Treasury Bill Discount

$$Y_T = \frac{Par - PP}{PP} \times \frac{360}{n}$$

# Commercial Paper

- Short-term debt instrument issued by well-known, creditworthy firms and is typically unsecured.
- Normally issued to provide liquidity or to finance a firm's investment in inventory and accounts receivable.
- The minimum denomination of commercial paper is usually \$100,000.
- Maturities are normally between 20 and 45 days but can be as short as 1 day or as long as 270 days.

# Commercial Paper

## 1. Ratings

- Assigned by rating agencies such as Moody's Investors Service, Standard & Poor's Corporation, and Fitch Investor Service.
- Serves as an indicator of the potential risk of default.

## 2. Credit Risk during the Credit Crisis

- Historically the percentage of issues that have defaulted is very low.
- During the credit crisis in 2008, Lehman Brothers (a large securities firm) failed.
- This made investors more cautious before purchasing securities

# Commercial Paper

## 3. Placement

- Firms place commercial paper directly with investors or rely on commercial paper dealers to sell their commercial paper.

## 4. Backing Commercial Paper

- Some backed by assets of the issuer and offers lower yield than unsecured commercial paper.
- Issuers of commercial paper typically maintain backup lines of credit.

## 5. Estimating the Yield

- Commercial paper does not pay interest and is priced at a discount from par value.
- The yield on commercial paper is higher than the yield on a T-bill with the same maturity because of credit risk and less liquidity.

## 6. Commercial Paper Yield Curve

- Represents the yield offered on commercial paper at various maturities.
- The same factors that affect the Treasury yield curve affect the commercial paper yield curve, but they are applied to very short-term horizons.



# Negotiable Certificates of Deposit

- Certificates issued by large commercial banks and other depository institutions as a short-term source of funds.
- The minimum denomination is \$100,000.
- Maturities on NCDs normally range from two weeks to one year.
- A secondary market for NCDs exists, providing investors with some liquidity.

# Negotiable Certificates of Deposit

## 1. Placement

- Some issuers place their NCDs directly; others use a correspondent institution that specializes in placing NCDs.

## 2. Premium

- Offer a premium above the T-bill yield in order to compensate for less liquidity and safety.

## 3. Yield

- Provide a return in the form of interest along with the difference between the price at which the NCD is redeemed (or sold in the secondary market) and the purchase price.

$$Y_{NCD} = \frac{SP - PP + \text{interest}}{PP}$$

# Repurchase Agreements

- With a repurchase agreement (repo), one party sells securities to another with an agreement to repurchase the securities at a specified date and price.
- A **reverse repo** is the purchase of securities by one party with an agreement to sell them.
- A repurchase agreement (or repo) represents a loan backed by the securities.
- Financial institutions often participate in repos.
- The size of the repo market is about \$4.5 trillion. Transaction amounts are usually for \$10 million or more.
- The most common maturities are from 1 day to 15 days and for one, three, and six months.

# Repurchase Agreements

## 1. Placement

- Negotiated through a telecommunications network.
- Dealers and repo brokers act as financial intermediaries to create repos for firms with deficient or excess funds, receiving a commission for their services.

## 2. Impact of the Credit Crisis

- Many financial institutions that relied on the market for funding were not able to obtain funds.
- Investors became more concerned about the securities that were posted as collateral

## 3. Estimating the Yield

$$\text{Repo rate} = \frac{SP - PP}{PP} \times \frac{360}{n}$$

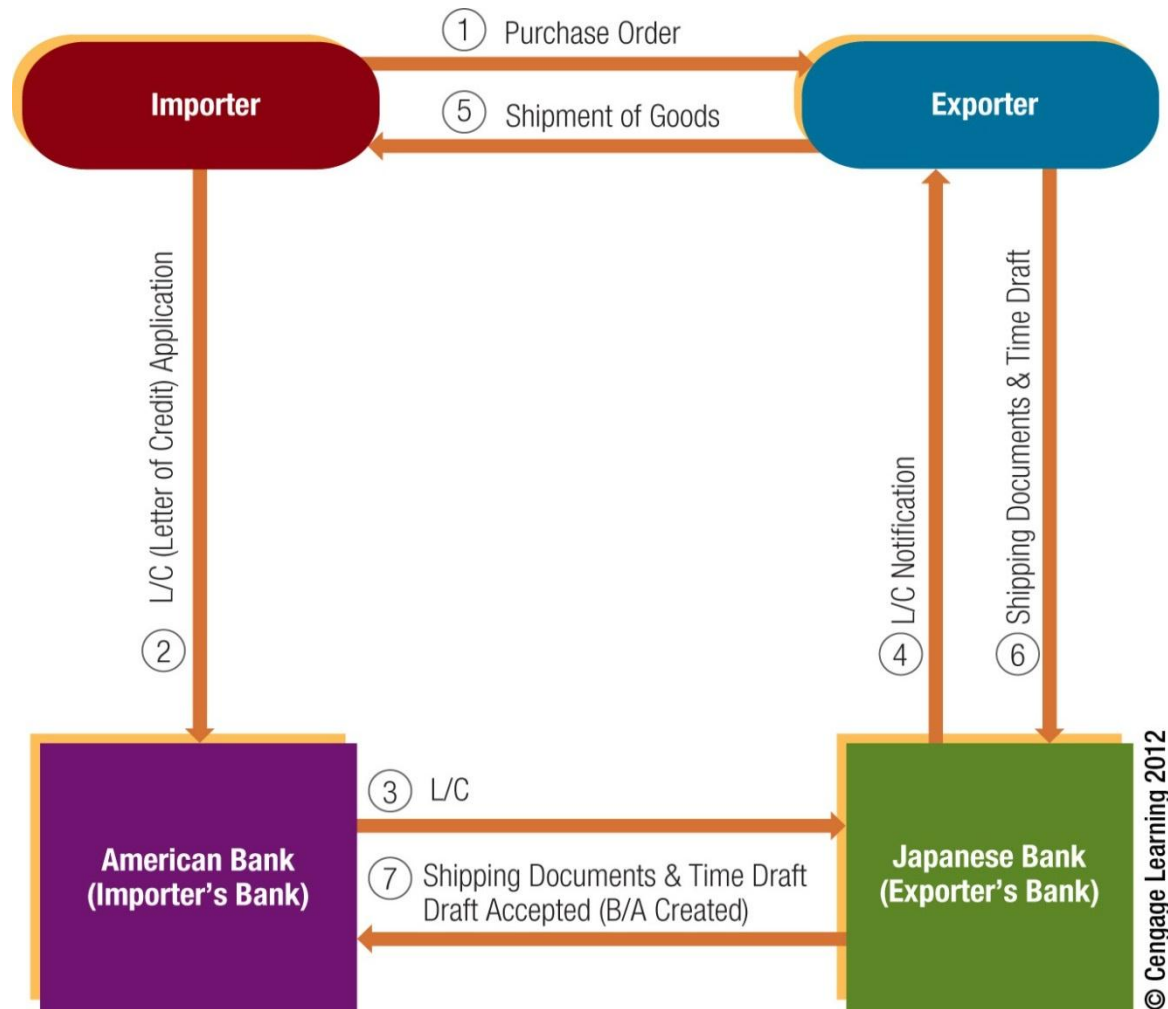
# Federal Funds

- Enables depository institutions to lend or borrow short-term funds from each other at the **federal funds rate**.
- The Federal Reserve adjusts the amount of funds in depository institutions in order to influence the federal funds.
- The rate is normally slightly higher than the T-bill rate at any given time.
- Commercial banks are the most active participants.
- The volume of interbank loans on commercial bank balance sheets over time is an indication of the importance of lending between depository institutions.

# Banker's Acceptances

- Indicates that a bank accepts responsibility for a future payment.
- Commonly used for international trade transactions.
- Exporters can hold a banker's acceptance until the date at which payment is to be made, but they frequently sell the acceptance before then at a discount to obtain cash immediately.
- Because acceptances are often discounted and sold by the exporting firm prior to maturity, an active secondary market exists.

# Exhibit 6.3 Sequence of Steps in the Creation of a Banker's Acceptance



# Exhibit 6.4 Survey of Commonly Issued Money Market Securities

SECURITIES	ISSUED BY	COMMON INVESTORS	COMMON MATURITIES	SECONDARY MARKET ACTIVITY
Treasury bills	Federal government	Households, firms, and financial institutions	13 weeks, 26 weeks, 1 year	High
Negotiable certificates of deposit (NCDs)	Large banks and savings institutions	Firms	2 weeks to 1 year	Moderate
Commercial paper	Bank holding companies, finance companies, and other companies	Firms	1 day to 270 days	Low
Banker's acceptances	Banks (exporting firms can sell the acceptances at a discount to obtain funds)	Firms	30 days to 270 days	High
Federal funds	Depository institutions	Depository institutions	1 day to 7 days	Nonexistent
Repurchase agreements	Firms and financial institutions	Firms and financial institutions	1 day to 15 days	Nonexistent

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# Institutional Use of Money Markets

- Financial institutions purchase money market securities in order to earn a return while maintaining adequate liquidity.
- Money market securities can be used to enhance liquidity in two ways.
  - Newly issued securities generate cash.
  - Purchased money market securities will generate cash upon liquidation.
- Financial institutions that purchase money market securities are acting as creditors to the initial issuers of the securities.

# Exhibit 6.5 Institutional Use of Money Markets

TYPE OF FINANCIAL INSTITUTION	PARTICIPATION IN THE MONEY MARKETS
Commercial banks and savings institutions	<ul style="list-style-type: none"><li>• Bank holding companies issue commercial paper.</li><li>• Some banks and savings institutions issue NCDs, borrow or lend funds in the federal funds market, engage in repurchase agreements, and purchase T-bills.</li><li>• Commercial banks create banker's acceptances.</li><li>• Commercial bank provide backup lines of credit to corporations that issue commercial paper.</li></ul>
Finance companies	<ul style="list-style-type: none"><li>• Issue large amounts of commercial paper.</li></ul>
Money market mutual funds	<ul style="list-style-type: none"><li>• Use proceeds from shares sold to invest in T-bills, commercial paper, NCDs, repurchase agreements, and banker's acceptances.</li></ul>
Insurance companies	<ul style="list-style-type: none"><li>• May maintain a portion of their investment portfolio as money market securities for liquidity.</li></ul>
Pension funds	<ul style="list-style-type: none"><li>• May maintain a portion of their investment portfolio as money market securities that may be liquidated when portfolio managers desire to increase their investment in bonds or stocks.</li></ul>

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# Valuation of Money Market Securities

## Market Price of Money Market Security ( $P_m$ )

$$P_m = \frac{Par}{(1+k)^n}$$

where  $Par$  = par value or principal amount to be provided at maturity

$k$  = required rate of return by investors

$n$  = time to maturity

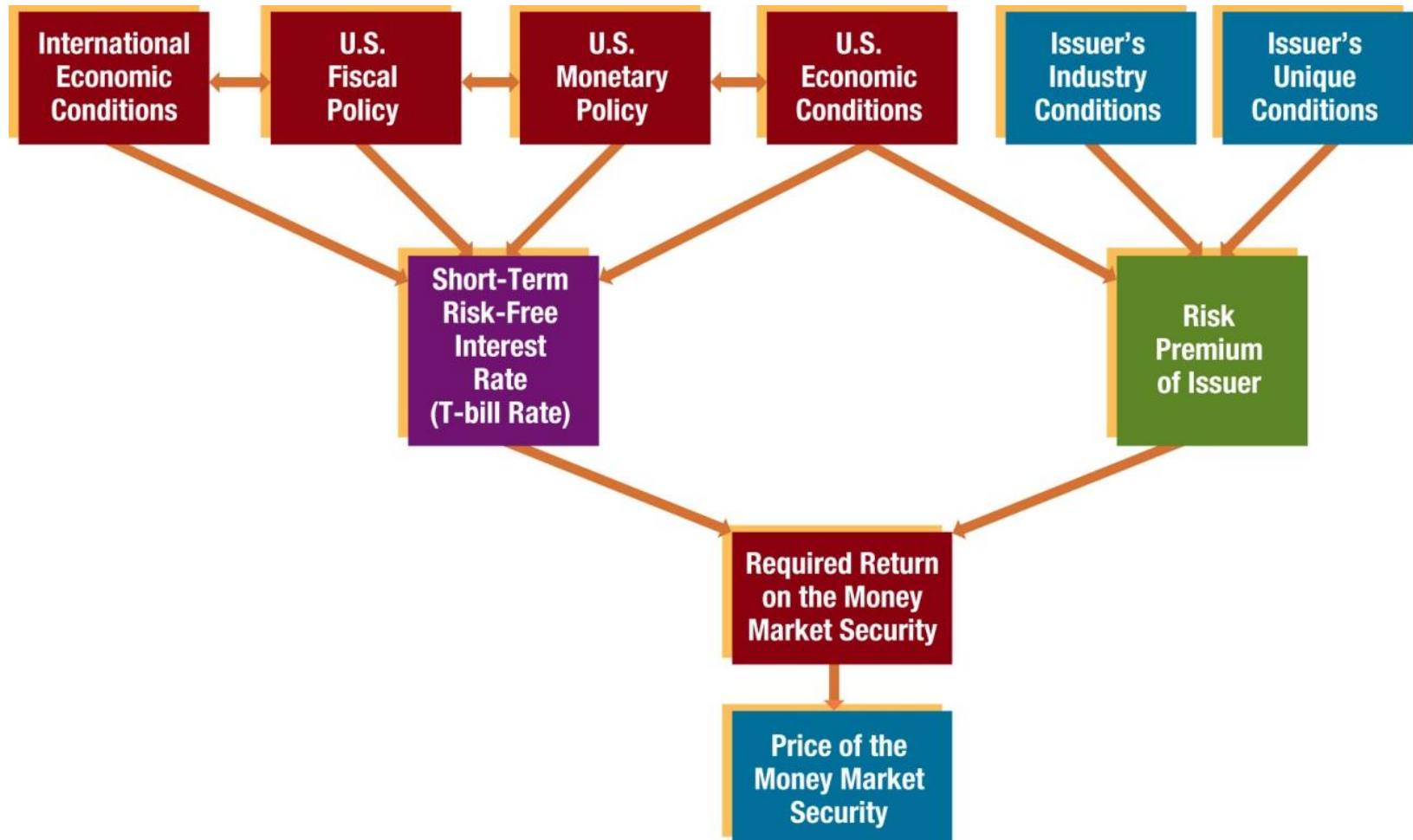
## A change in $P_m$ can be modeled as:

$$\Delta P_m = f(\Delta k) \text{ and } \Delta k = f(\Delta R_f, \Delta RP)$$

where  $R_f$  = risk - free interest rate

$RP$  = risk premium

# Exhibit 6.6 Framework for Pricing Money Market Securities



# Impact of Changes in Credit Risk

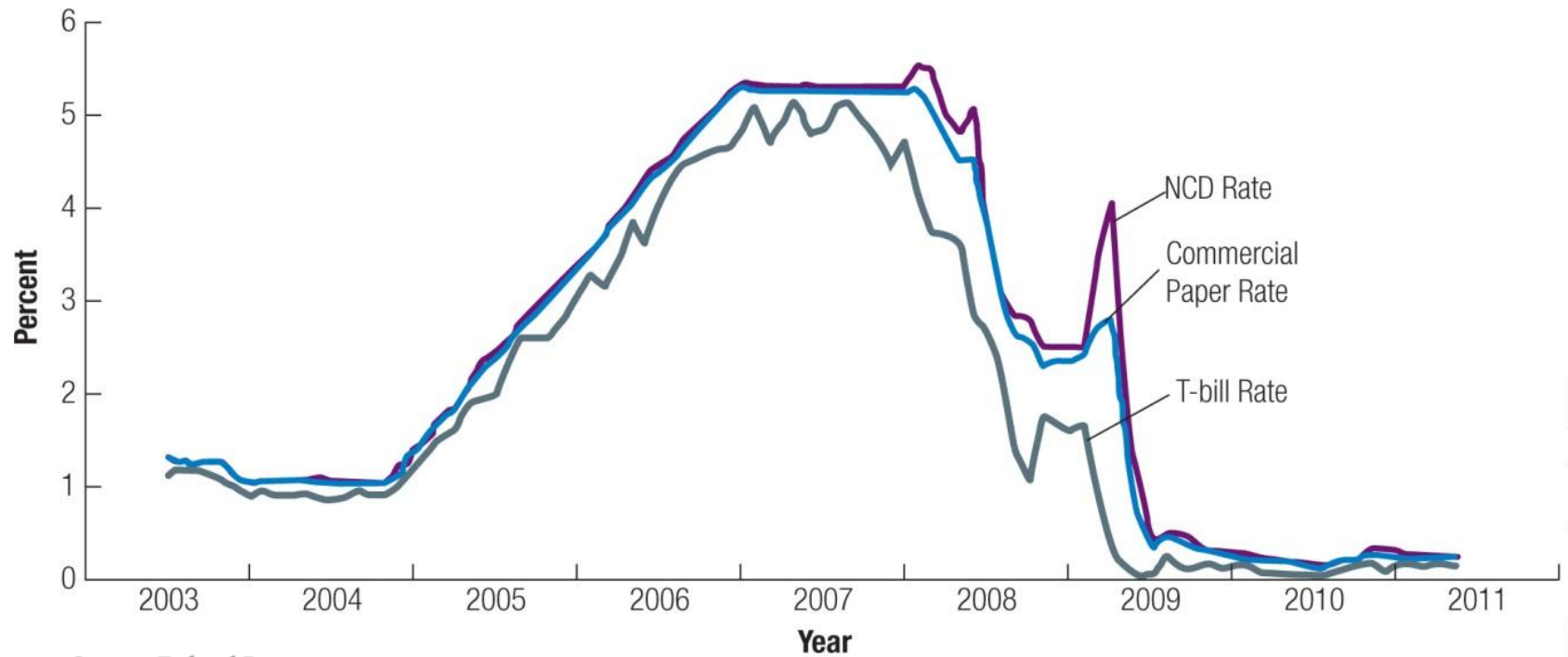
## 1. Credit risk following Lehman's default

- Institutional investors were less willing to invest in commercial paper because of concerns that other firms might default. As a result, many firms were no longer able to rely on the commercial paper market for short-term funding.
- The Emergency Economic Stabilization Act of 2008 was enacted, which helped to stabilize the money markets.
- In November 2008, the Fed began to purchase commercial paper issued by highly rated firms to increase liquidity in the commercial paper market.

## 2. Risk Premiums among Money Market Securities

- a. During periods of heightened uncertainty, investors shift from risky money market securities to Treasury securities in a **flight to quality**.

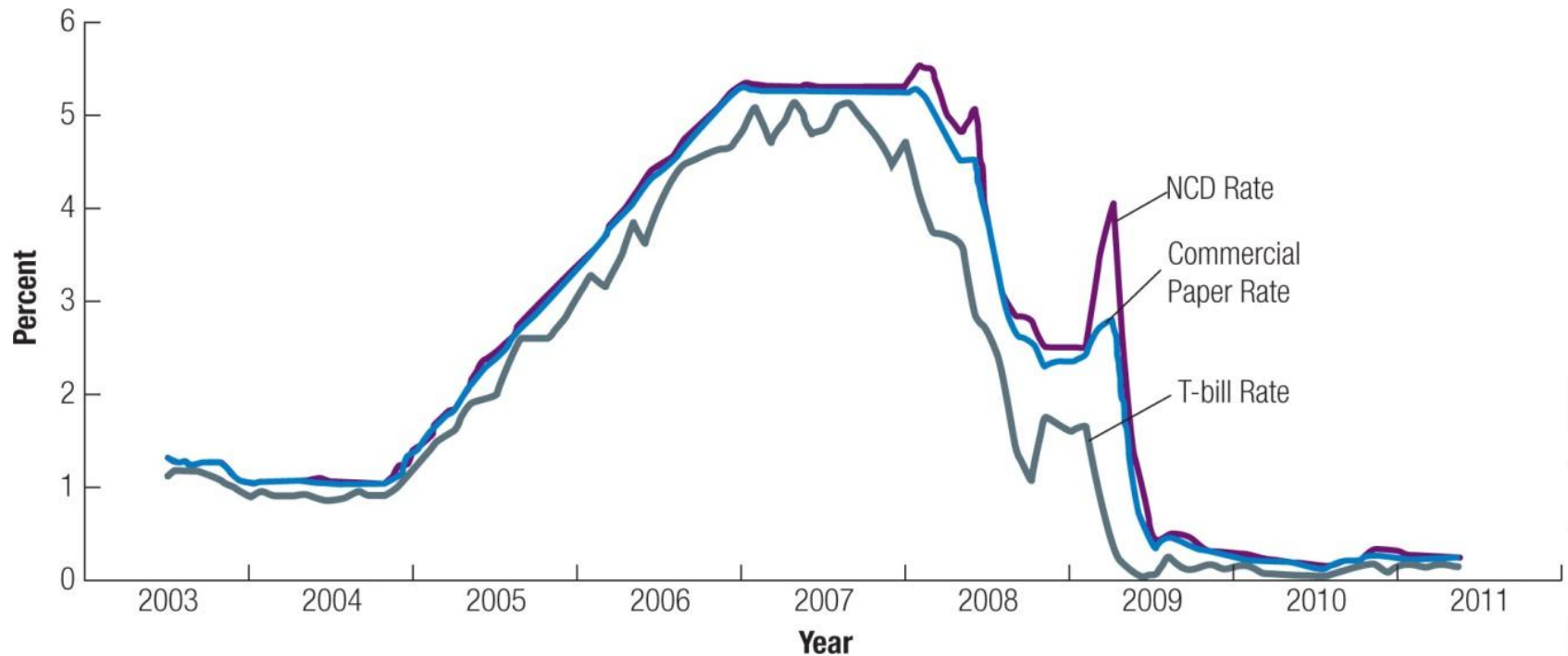
# Exhibit 6.7 Value of Commercial Paper Outstanding over Time



Source: *Federal Reserve*.

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# Exhibit 6.8 Money Market Yields over Time (Annualized Yields, One-Month Maturity)



Source: *Federal Reserve*.

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# Interest Rate Risk

1. If short-term interest rates increase, the required rate of return on money market securities will increase and the prices of money market securities will decrease.
2. An increase in interest rates is not as harmful to a money market security as it is to a longer term bond.
3. Measuring Interest Rate Risk
  - Participants in the money markets can use sensitivity analysis to determine how the value of money market securities may change in response to a change in interest rates.



# Exhibit 6.9 Probability Distribution of Proceeds from Selling Money Market Securities

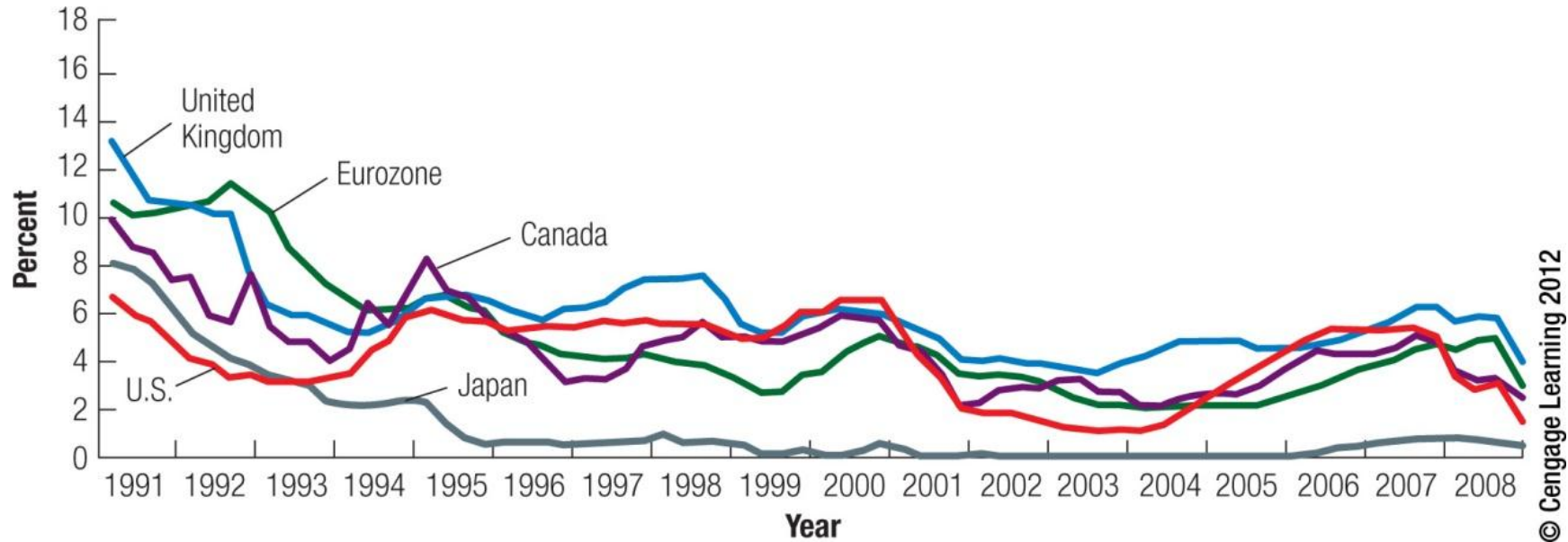
SCENARIO FOR REQUIRED RATE OF RETURN	PROBABILITY	VALUE OF SECURITIES IF SCENARIO OCCURS
3%	33.3%	\$97,087,379
3.5%	33.3%	\$96,618,357
3.8%	33.3%	\$96,339,113

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# Globalization of Money Markets

- As international trade and financing have grown, money markets have developed in Europe, Asia, and South America.
- The flow of funds between countries has increased as a result of tax differences among countries, speculation on exchange rate movements, and a reduction in government barriers that were previously imposed on foreign investment in securities.

# Exhibit 6.10 International Money Market Rates over Time



Source: *Federal Reserve*.

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# Globalization of Money Markets

## 1. Eurodollar Securities: dollar deposits in Europe

- a. Eurodollar CDs - large, dollar-denominated deposits (such as \$1 million) accepted by banks in Europe.
- b. Euronotes - short-term securities issued in bearer form with common maturities of one, three, and six months.
- c. Euro-commercial paper - issued without the backing of a banking syndicate. Maturities can be tailored to satisfy investors.

## 2. International Interbank Market - facilitates the transfer of funds from banks with excess funds to those with deficient funds.

# Globalization of Money Markets

## 3. Performance of Foreign Money Market Securities

Measured by the **effective yield**  $Y_e$

(yield adjusted for the exchange rate)

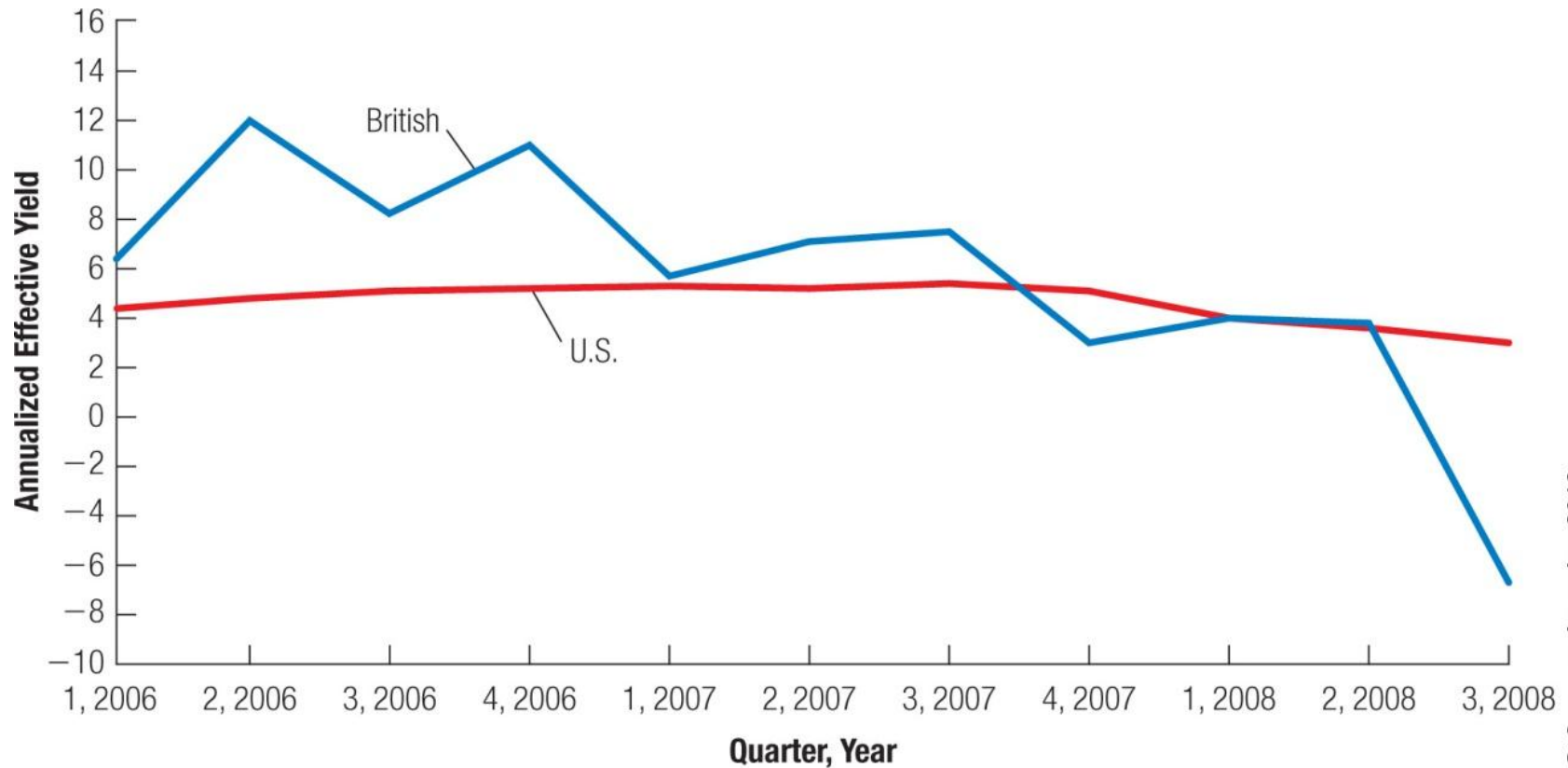
$$Y_f = \frac{SP_f - PP_f}{PP_f}$$

where  $SP_f$  = selling price of the foreign money market security  
in the foreign currency

$PP_f$  = purchase price of the foreign money market security  
in the foreign currency

$$Y_e = (1 + Y_f) \times (1 + \% \Delta S) - 1$$

# Exhibit 6.11 Comparison of Effective Yields between U.S. and British Money Market Yields for a U.S. Investor



Source: *Federal Reserve*.

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# SUMMARY

- The main money market securities are Treasury bills, commercial paper, NCDs, repurchase agreements, federal funds, and banker's acceptances. These securities vary according to the issuer. Consequently, their perceived degree of credit risk can vary. They also have different degrees of liquidity. Therefore, the quoted yields at any given point in time vary among money market securities.
- Financial institutions manage their liquidity by participating in money markets. They may issue money market securities when they experience cash shortages and need to boost liquidity. They can also sell holdings of money market securities to obtain cash.

# SUMMARY (Cont.)

- The value of a money market security represents the present value of the future cash flows generated by that security. Since money market securities represent debt, their expected cash flows are typically known. However, the pricing of money market securities changes in response to a shift in the required rate of return by investors. The required rate of return changes in response to interest rate movements or to a shift in the security's credit risk.
- Interest rates vary among countries. Some investors are attracted to high interest rates in foreign countries, which cause funds to flow to those countries. Consequently, money markets have become globally integrated. Investments in foreign money market securities are subject to exchange rate risk because the foreign currency denominating the securities could depreciate over time.